OCR
Oxford Cambridge and RSA

GCE

Chemistry B

Unit **H033/01:** Foundations of chemistry

Advanced Subsidiary GCE

Mark Scheme for June 2018

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

Annotations

Annotation	Meaning
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
( )	Words which are not essential to gain credit
__	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

Annotation	Meaning
	Correct response
	Incorrect response
^	Omission mark
BOD	Benefit of doubt given
CON	Contradiction
RE	Rounding error
SF	Error in number of significant figures
FCF	Error carried forward
L1	Level 1
L2	Level 2
L3	Level 3
NBOD	Benefit of doubt not given
SEEN	Noted but no credit given
I	Ignore

Subject-specific Marking Instructions

INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

Section A

Q	Key	AO
1	A	1.2
2	B	1.1
3	C	1.2
4	A	2.1
5	B	1.2
6	B	1.2
7	A	1.1
8	C	2.8
9	D	2.2
10	A	1.2
11	B	2.5
12	B	2.1
13	C	1.2
14	D	2.8
15	A	2.8
16	A	2.4
17	D	1.2
18	C	2.1
19	C	1.2
20	A	2.1

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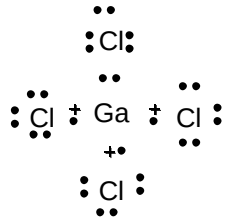
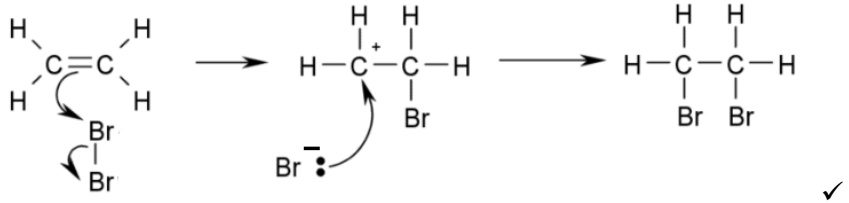
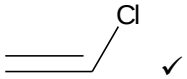
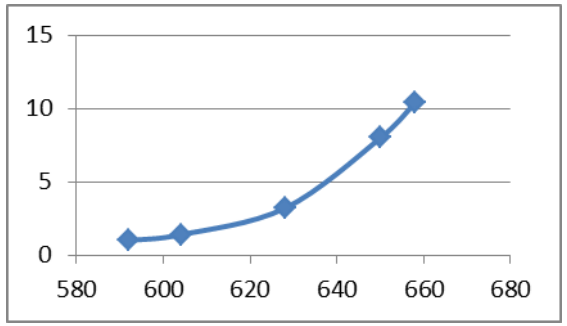
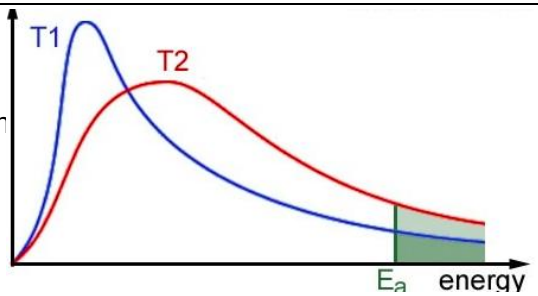
Question			Answer	Marks	Guidance
21	a		violet/purple/mauve/lilac ✓	1	**ALLOW** anything which suggests a mixture of red and blue (This is a definition of purple) **IGNORE** reference to starting colour
21	b	i	CH_3COOH ✓	1	**ALLOW** any unambiguous structural formula
21	b	ii	(10 x 1.1/102) = 0.11 ✓	1	Evidence of calculation **NOT** required **ALLOW** 0.1078..... OR 0.108
21	b	iii	(Amount salicylic acid = 6/138) = 0.043 (1 or more sf) (mol)✓ (amount ethanoic anhydride = 0.11) so ethanoic anhydride (in excess.) ✓	2	Second mark dependent on evidence of calculation (ECF). **ALLOW** ECF from 21bii
21	c	i	(solute/aspirin/solid) soluble in hot **AND** less soluble/insoluble in cold ✓	1	
21	c	ii	melting point ✓	1	**ALLOW** GLC or HPLC or TLC **DO NOT ALLOW** just **"**chromatography". **NOT** "titration"
21	d		**CHECK ANSWER ON ANSWER LINE** If answer lies within range 39% to 40.1% award 2 marks (2sf or more) ✓✓ **OR** 100% yield = 0.043(5) x 180 **OR** 7.74g **OR** 7.83 (if 0.435 used)✓ % yield = 3.1 x 100/100% yield calculated above ✓	2	**Alternative:** Moles aspirin formed = 3.1/180 **OR** 0.017(2) ✓ % yield = moles of aspirin calculated above x 100/0.043(5) ✓ **ALLOW** calculations dependent on ECF from 21biii {i.e. either incorrect value for moles of salicylic acid **OR** answers based on moles of ethanoic anhydride (calculated in 21bii) if salicylic acid said to be in excess – this gives yield =16%}
21	e		(fractional) distillation ✓	1	
21	f		It does show that phenol is acidic (AW) ✓ phenol not a strong enough acid to react with carbonates (AW)✓	2	"Acid" mentioned for 2nd marking point subsumes 1st marking point

Question			Answer	Marks	Guidance
					ALLOW sodium carbonate is not a strong enough base (to react with phenol) for 2nd marking point.
				12	

Question			Answer	Marks	Guidance
22	a		electrons in energy <u>levels</u> ✓ electrons drop levels ✓ energy released <u>proportional</u> to frequency (or E = hv) ✓ different elements have different gaps ✓	4	**IGNORE** reference to electrons being promoted (by heat). 2nd marking point subsumes 1st marking point if energy and <u>levels</u> mentioned anywhere. **ALLOW** "return to ground state" for 2nd mp **ALLOW** different elements have different /unique energy levels/shells for 4th marking point
22	b	i	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^1$ ✓	1	**ALLOW** $4s^2 3d^{10} 4p^1$ **ALLOW** capital letters but not subscripts
22	b	ii	Spherical ✓	1	**IGNORE** circular **ALLOW** sphere
22	b	iii	3+ ✓	1	**ALLOW** +3 or Ga^{3+} or in words
22	c	i	 dative bond from Cl^- to Ga and 8 electrons shown on chloride✓ 3 electron pairs to chlorine atoms and rest correct ✓	2	**IGNORE** presence or absence of minus charge **ALLOW** another symbol for the extra electron on dative bonded chloride. **ALLOW** G_A and CL
22	c	ii	Tetrahedral ✓	1	**ALLOW** tetrahedron **NOT** trigonal pyramid
22	d		**CHECK ANSWER ON ANSWER LINE** 65% scores 2✓✓ 69x/100 + 71(100 – x)/100 = 69.7 **OR** 69x +71(1-x) = 69.7✓ Answer = 65% ✓	2	**NO** ecf from a wrong equation **ALLOW** calculation based on x as the percentage of Ga^{71} for first mark
				12	

Question			Answer	Marks	Guidance
23	a	i	Naphtha (labelled) heated in tube/flask (or absorbed on wool etc) ✓ Passing over <u>heated</u> Al_2O_3 (labelled) in tube✓ collection over water ✓	3	
23	a	ii	from brown to colourless/ brown decolorised ✓	1	
23	a	iii	 ✓ ✓ ✓	3	
23	b	i	provide route (AW) of lower activation enthalpy ✓	1	
23	b	ii	<u>adsorption</u> (of reactant molecules by catalyst) ✓	1	
23	c	i	 ✓	1	
23	c	ii	Incorrect - because of two hydrogen atoms /identical groups on one C (AW) ✓	1	
				11	

Question			Answer	Marks	Guidance
24	a		acid rain/ poisonous/toxic (to humans) ✓	1	
24	b		(relative) rate  T/K Labelled axes with T as x-axis and units for T ✓ Suitable choice of scale to fill at least half the grid in both directions ✓ Attempted smooth curve through points **AND** Relative rate at 615 = 2 ±0.2 ✓	3	
24	c		number of molecules with energy E  Two lines, starting at the origin, rising to a peak and then falling but not touching x-axis **AND** higher temperature line (labelled or indicated in text) with lower peak to right of other and ending higher above x-axis ✓ Ea shown with comment that more/larger proportion of molecules/particles have energy => Ea at higher T✓ More/larger proportion of collisions with enough energy to react (mean(s) a faster rate) ✓	3	
24	d	i	$K_c = [NO]^2/[N_2]\,[O_2]$ ✓	1	

Question			Answer	Marks	Guidance
24	d	ii	Statement 1 is correct AND statement 2 is incorrect ✓ Concentrations (of reactants and products) remain <u>constant</u> (but not necessarily equal) ✓	2	
24	d	iii	Temperature – increased yield with increased temperature ✓ (forward) reaction is endothermic ✓ Equilibrium (position) moves to the right/endothermic direction✓ Pressure – no effect on yield ✓ equal moles on each side ✓	5	
				15	

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